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08/838,910 04/11/97 TANAKA

A 235648

EXAMINER

IM62/0802

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TUNG, T.
ART UNIT

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper No. 33

Serial Number: 08/838,910
Filing Date: April 11, 1997
Appellant(s): Akio Tanaka et al.

David S. Taylor
For Appellant

MAILED

AUG 12 1999

EXAMINER'S ANSWER

GROUP 1T00

This is in response to Appellant's brief on appeal filed
June 15, 1999.

(1) *Real Party in Interest.*

Appellant has stated that the real party in interest is
Nippondenso Co. Ltd.

(2) *Related Appeals and Interferences.*

Appellant has stated that no related appeal has been filed.

(3) *Status of claims.*

This appeal involves claims 21-26 and 31-37. Claim 31 is
hereby allowed. Claims 12-15 and 27-30 stand as being previously
allowed.

(4) *Status of Amendments After Final.*

The amendment of April 7 1999 after the final rejection has
been entered.

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(5) *Summary of invention.*

The summary of invention contained in the brief is correct.

(6) *Issues.*

The Appellant's statement of the issues in the brief is correct.

However, the rejection of claims 21-26 and 31 under 35 U.S.C. 112, first paragraph, is hereby withdrawn. Thus, claim 31 is allowed as indicated above.

The prior art rejections with Sakurai as a primary reference are also hereby withdrawn as being cumulative in order to simply the issues.

(7) *Grouping of claims.*

Appellant states that claims 21-26 and 36 should stand or fall together, while claims 32-35 and 37 should stand or fall together.

(8) *Claims appealed.*

A correct copy of the claims on appeal is contained in the Appendix to the amended brief.

(9) *Prior Art of record.*

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

4,021,326	Pollner etal (Pollner)	5-77
4,452,687	Torisu etal (Torisu)	6-84

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4,540,479	Sakurai etal (Sakurai)	9-85
4,900,412	Ker etal (Ker)	2-90
4,935,118	Agarwal etal (Agarwal)	6-90

(10) *New prior art.*

No new prior art has been applied in this Examiner's Answer.

(11) *Grounds of rejection.*

The following ground(s) of rejection are applicable to the appealed claims.

I. Claims 21-26 and 36 stand rejected under 35 USC 103(a) over Torisu in view of Sakurai and Pollner. The Maurer and Ker references used alternatively with Sakurai in the final rejection are hereby withdrawn as being cumulative.

Torisu discloses a solid electrolyte sensor element 1 including a porous layer 4 made of alumina over an inner electrode 2. See the paragraph bridging columns 2 and 3. Alumina has an emissivity of 0.3 (according to appellant's specification, page 12, table 1). Appellant's claims differ by calling for a heater disposed within the sensor element adjacent the inner electrode at a distance of 0.1 mm or more, and by calling for the layer over the inner electrode to have a porosity of more than 10%.

Sakurai discloses a heater 5 located within a solid electrolyte sensor element 1 adjacent an inner electrode 2. See col. 3, lines 1-67. Pollner discloses a solid electrolyte sensor

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having a porous layer 14 with a porosity of 10 to 50% over an electrode. See col. 5, lines 19-32.

It would have been obvious for Torisu to place a heater inside the sensor element adjacent the inner electrode in view of Sakurai. It is not disputed that solid electrolyte sensors only operate at elevated temperatures (usually above 400 degrees C). The heat present in a sample may be sufficient to bring the solid electrolyte to its operational temperature. However, a heater is often provided for the sensor to ensure that condition. The heater may be located externally of the sensor. But, locating the heater within the sensor element itself, as in Sakurai, has the advantages of localized, efficient heating as well as streamlined configuration.

As for the gap of 0.1 mm or more between the heater and the high emissivity layer on the inner electrode, it is a matter of routine design choice. Since the sensor element typically is a very small device, a gap in the order of 0.1 mm would be commensurate with the norm. Further, the reference air must pass through this gap between the heater and the inner electrode in order to contact the latter. Thus, the gap must be sufficiently large to accommodate the passage of reference air. To ascertain a range of dimensions for the gap to ensure good contact of the reference air with the inner electrode would be within the ordinary skill of an artisan. This is especially so when

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appellant's range is extremely large (0.1 mm and everything over that) and does not even have an upper limit.

It would also have been obvious for Torisu to adopt the porosity value of Pollner for its layer over the inner electrode. This is so, because, while this layer protects the inner electrode, it must also at the same time be sufficiently porous to permit the passage of the reference air. A porosity value of more than 10% would obviously accomplish both purposes. Further, Pollner is totally analogous to Torisu. Incorporating conventional features from analogous prior art is within the skill of the art.

II. Claims 32-35 and 37 stand rejected under 35 USC 103(a) as unpatentable over Ker in view of Agarwal.

Ker discloses a solid electrolyte sensor element including a heater located within the element adjacent to but spaced from an inner electrode. The heater has a polygonal cross section. See col. 3, line 46; col. 4, lines 15-39. Appellant's claims differ by calling for the gap between the heater and the inner electrode to be 0.1 mm or more, and for the heater to have an emissivity of 0.6 or more.

Agarwal discloses a heater made of silicon nitride, aluminum nitride or silicon carbide for a solid electrolyte sensor. See col. 4, lines 10-17. It is clear that heaters made of these

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materials have an emissivity of 0.6 or more, since appellant's claim 34 recite these same materials for the heater.

It would have been obvious for Ker to adopt a heater made of silicon nitride, aluminum nitride or silicon carbide in view of Agarwal, since these heater materials are readily available and inexpensive. Further, Ker and Agarwal are totally analogous. The incorporation of conventional features from analogous prior art is within the skill of the art.

In regard to the gap of 0.1 mm or more between the heater and the high emissivity layer on the inner electrode, that is obvious as discussed in the previous rejection.

Response to arguments.

For rejection I, appellant argues that there is no basis for combining the references to arrive at appellant's porosity of more than 10% for the layer over the inner electrode. It is asserted that Pollner's porous layer 14 covers the external electrode, not the inner electrode. A layer over the external electrode protects against the exhaust gas sample, while a layer over the inner electrode does not contact the exhaust gas but instead protects against silicon gas poisoning that requires a porosity of less than 10% in order to function properly.

In support of his arguments, appellant points to Japan abstract 215059 as showing the layer over the inner electrode (the reference electrode) to be for the purpose of protecting

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against silicon poisoning. It is contended by appellant that those of ordinary skill in the art would understand that a silicon poisoning preventing layer must have fine porosity. Appellant further points to Japan 77946 as showing a layer 5 over an inner electrode to have a glass-like structure in which its atomic arrangement has a retinal structure. Further, Japan 77946 is said to treat its layer 5 at 1500 degrees C, which would produce a structure having a fine porosity.

Appellants argument is not persuasive. First, one of ordinary skill in the art would recognize that the inner electrode and the outer electrode face different environments and thus design their protective layers accordingly.

Second, there is no basis to conclude that one of ordinary skill in the art would expect that the protective layer over the inner electrode needs to have a porosity of less than 10% in order to function properly. Japan abstract 215059 merely suggests that the inner electrode protective layer serves to protect against silicon poisoning, but there is no suggestion of what the porosity of this layer should be. Appellant's assertion that one of ordinary skill in the art would understand that preventing silicon poisoning would require fine porosity is unsubstantiated. Besides, fine porosity does not necessarily mean porosity less than 10%. As for Japan 77946, appellant has not submitted a translation for consideration. Even taken at

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face value and assuming appellant's discussion of this document to be accurate, it is clear that Japan 77946 falls far short of supporting appellant's position. There is apparently no teaching of the porosity value for the inner protective layer 5 (otherwise appellant presumably would have stated what that porosity value is). The heat treatment producing a fine porosity is conjecture. Besides, fine porosity does not necessarily mean less than 10%.

Appellant also argues that there is no motivation to combine the references to match his claimed range of more than 50% porosity. That range was selected in order to permit access of the reference air to the inner electrode and this concept is not suggested by the cited prior art.

This argument is also not persuasive. The prior art (Torisu, col. 5, line 39; Sakurai, col. 3, line 55) has reference air contacting the inner electrode as well. It would be inescapably clear to one of ordinary skill in the art that any protective layer over the inner electrode must have sufficient porosity to permit good contact between the electrode and the reference air. Picking a range of porosity over 10% to satisfy that requirement would be abundantly obvious. In fact, the reverse, selecting porosity less than 10%, may actually be nonobvious.

It should also be pointed out that appellant's claimed porosity range occupies 90% of all values, hardly a critical,

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narrow band. The range is so large as to tend to make the limitation illusory. For instance, what if appellant's claimed porosity range is ~~more~~ more than 1%, a value not all that different from the 10% value? This range would occupy 99% of all values and be virtually all encompassing. Such a limitation is essentially illusory.

For rejection II appellant argues that there is no motivation to combine Ker and Agarwal. Appellant found that a heater made of a material having an emissivity over 0.6 overcomes the problem of heat accumulation peculiar to a heater disposed within a solid electrolyte. This is not taught by the cited patents.

This argument is not persuasive. It is evident from the discussion at col. 4, lines 10-17 of Agarwal that silicon nitride, aluminum nitride and silicon carbide are among the most common materials for heaters. These are also readily available and inexpensive ceramics. That, plus Ker and Agarwal being totally analogous, would be sufficient motivation for combining them. Further, a heater is disposed either inside or outside of a sensor element. Why would one of ordinary skill in the art choosing an inside heater, as in Ker, not look toward conventional heater materials?

As for the problem of heat accumulation by a heater within a solid electrolyte element, that is not considered to be all that

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surprising. The structure entails a heater operating in excess of 400 degrees C and disposed within the very narrow confine of a sensor element. Heat accumulation would hardly be unexpected.

For the above reasons, it is submitted that the rejections applied against the appealed claims should be sustained by the Board of Appeals.

Respectfully submitted,


Ta Tung
Primary Examiner
Art Unit 1744

T. Tung
July 29, 1999

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